

END SEMESTER EXAMINATION MAY-2023

Course Name: - B.Tech(CSE, EE, ECE)

Semester:- 4th

Paper Name: - Engineering Mathematics-III

Paper Code:- TBS-402

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer.

Max Marks-70

समय- 3 घण्टे + 20 मिनट प्रति घंटे अतिरिक्त-दृष्टिबाधित एवं सह लेखक परीक्षार्थियों के लिए।

अधिकतम अंक-70

Instructions:

- The question paper consists of three sections namely A, B, C. All sections are compulsory.
- Section A- Each question carries 3 mark. All questions are compulsory.
- Section B- Answer any 5 out of 6 given questions in maximum hundred (150) words. Each question carries 7 marks.
- Section C- Answer any 2 out of 3 given questions in maximum five hundred (500) words. Each question carries 10 marks.

निर्देश:

- प्रश्न पत्र में तीन खण्ड अ, ब, व स हैं। सभी खण्ड अनिवार्य हैं।
- खण्ड-अ में प्रत्येक प्रश्न तीन अंक का है। सभी प्रश्न अनिवार्य हैं।
- खण्ड-ब में छः प्रश्नों में से किन्हीं पाँच प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें। प्रत्येक प्रश्न सात अंक का है।
- खण्ड-स में तीन प्रश्नों में से किन्हीं दो प्रश्नों के उत्तर अधिकतम (300) शब्दों में दें। प्रत्येक प्रश्न 10 अंक का है।

Section - A (खण्ड-अ)

Objective Questions (वस्तुनिष्ठ प्रश्न)

1. Answer all the following questions.

5×3 =15

निम्नलिखित सभी प्रश्न अनिवार्य हैं।

- i) The value of $\int_c \frac{dz}{z+2}$, where $c: |z| = 1$, is
- a) $2\pi i$
 - b) $-2\pi i$
 - c) $4\pi i$
 - d) 0
- ii) The necessary conditions for a function $f(z) = u + iv$ to be analytic at all the points in a region R are
- a) (i) $\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y}$ and (ii) $\frac{\partial u}{\partial x} = -\frac{\partial v}{\partial y}$
 - b) (i) $\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y}$ and (ii) $\frac{\partial u}{\partial y} = -\frac{\partial v}{\partial x}$
 - c) (i) $\frac{\partial u}{\partial y} = \frac{\partial v}{\partial x}$ and (ii) $\frac{\partial u}{\partial y} = -\frac{\partial v}{\partial x}$
 - d) (i) $\frac{\partial u}{\partial x} = \frac{\partial v}{\partial x}$ and (ii) $\frac{\partial u}{\partial y} = -\frac{\partial v}{\partial y}$
- iii) As per Cauchy's integral formula the value of the integral $\oint \frac{f(z)}{z-a} dz$ is
- a) $2\pi i f(a)$
 - b) $2\pi i$
 - c) 0
 - d) 2π
- iv) The value of central difference operator δ is:
- a) $\left[E^{\frac{1}{2}} - E^{-\frac{1}{2}} \right]$
 - b) $\frac{1}{2} \left[E^{\frac{1}{2}} - E^{-\frac{1}{2}} \right]$
 - c) $\frac{1}{3} \left[E^{\frac{1}{2}} - E^{-\frac{1}{2}} \right]$
 - d) $\frac{1}{4} \left[E^{\frac{1}{2}} - E^{-\frac{1}{2}} \right]$
- v) Let $f(0) = 1, f(1) = 2.72$, then the Trapezoidal rule gives approximate value of $\int_0^1 f(x) dx$ is
- a) 3.72

- b) 1.86
c) 1.72
d) 0.86

Section - B (खण्ड-ब)
Short Answer Questions (लघुउत्तरीय प्रश्न)

2. Answer any five of the following questions in maximum 150 words.

5×7=35

निम्नलिखित में से किन्हीं पाँच प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें।

- i. Find the analytic function $f(z) = u + iv$, given that $v = e^x(x \sin y + y \cos y)$.
- ii. Expand $f(z) = \frac{1}{(z+1)(z+3)}$ is Laurent series valid for a) $1 < |z| < 3$, b) $|z| > 3$ and c) $|z| < 1$.
- iii. Evaluate a) $\Delta \tan^{-1} x$ and b) $\Delta(x + \cos x)$.
- iv. Use the Picard's method, find a solution of $\frac{dy}{dx} = 1 + xy$ upto the third approximation, when $x_0 = 0, y_0 = 0$.
- v. Find the interpolating polynomial for the following table:

x	0	1	2	5
$f(x)$	2	3	12	147

- vi. Write the convergence of Newton-Raphson Method and the smallest positive root of $x^2 - 5x + 3 = 0$ by using Newton-Raphson method.
- vii. Discuss about the Residue theorem and Milne Thomson Method.

Section - C (खण्ड-स)
Descriptive Questions (विवरणात्मक प्रश्न)

3. Answer any two of the following question in maximum 300 words.

2×10=20

निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर अधिकतम 300 शब्दों में दें।

- i) (a) Evaluate the following integral using Cauchy integral formula $\int_C \frac{4-3z}{z(z-1)(z-2)} dz$, where C is the circle $|z| = \frac{3}{2}$.
- (b) Find the order of each pole and residue of $\frac{1-2z}{z(z-1)(z-2)}$.

- ii) (a) Using Newton's forward interpolation formula, find the cubic polynomial and hence evaluate $f(0.5)$ by the following data:

x	0	1	3	4
$f(x)$	-1	0	50	123

- (b) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ by using Simpson's $\frac{1}{3}^{rd}$ rule. Hence obtain the approximate value of π dividing the range into 6 equal parts.
- iii) (a) If the Variance of Poisson distribution is 2, find the probabilities for $r = 1, 2, 3, 4$ from the recurrence of the Poisson distribution. Also find $P(r \geq 4)$.
- (b) Using the Euler's method solve the differential equation in six steps: $\frac{dy}{dx} = x + y$, $y(0) = 0$ choosing $h = 0.2$.